in claims 36-39, is clearly dot made obvious by the combination of Balch and Haff under 103.

Briefly, an important feature of our invention is the combination of (1) having a plurality of capillaries with end openings of a diameter which prevents biomolecules from being pulled down by gravity in a non-depositing condition, (2) means for applying voltage between the plurality of capillaries and the substrate during the depositing condition to cause the biomolecules to be deposited in a controlled manner by force of gravity on the substrate, and (3) stopping the application of voltage so that the biomolecules are again held within the capillaries by the surface tension at the openings being greater than the force of gravity during the non-depositing condittion.

Clearly, these combined features are not taught by nor made obvious by the combined references Balch and Haff.

Haff clearly does not control application of electric field to enable the biomolecules to fall down through the openings during the depositing conditon and does not have end openings of a diameter which prevents biomolecules from falling down during the non-depositing condition.

Moreover, Blach clearly does not apply electric field to enable biomolecules to fall down through the openings during the depositng state and does notteach end openings of a diameter to other wise hold the biomolecules in the capillaries during the non-depositing state when no electric is applied.

This type of new controlled use of electric combined with

the controlled diameter size of the end openings to enable reliable and uniform deposits of biomolecules on a substrate is completely novel in the art, insofar as we are aware. Both Haff and Balch use pressure to control the flow and stop the flow of biomolecules through a capillary. In addition, Balch suggests "electro-osmosis and electrophoresis" to facilitate flow after the capillary is blown free (called "priming" by Balch) by pressure. (See col. 15, lins 44-52 of Balch). BUT, nowhere is the inventive concept of use of the combination of controlled use of electric field and controlled size of diameter of the end openings to selectively control the deposit of biomolecules onto a substrate at reliable and uniform rates shown in the prir art. This concept is clearly novel and patentable.

The Examiner alleges that Balch teaches use of "electro-osmosis or electrophoresis" and points to col. 15, lines 44-52, and claims 15(directed to pressure and hencenot relevant) 18 and 19.

However, careful reading of that portion of the Balch disclosure as well as the entire patent, shows that the foregoing is not the same as nor even close to applicant's recited teachings, as discussed above. Balch does not specify use of the electric field combined with the controlling fo the size of the end opening thereby to control the deposit of biomolecules in the manner above discussed for the applicant's recited invention.

Furthermore, Balch states "<u>After priming</u> (which is done by use of pressure) <u>continous flow</u> of the probe solution through the

capillaries is thereafter facilitated.... by electro-osmatic or electro-phertic force (where the tubes, storage vessels, and reaction chamber are appropriately modified to maintain and modulate an electro-osmatic and/or electrophoretic potential).."

Thus, clearly, Balch does not teach nor suggest nor even contemplate any use of the surface tension at the capillary opening end to stop the flow in a non-deposit condition, combined with the use of electric to cause deposit against the surface tension force during the depositing condition, as does applicant.

Clearly, the instant features are completely different from any combination of Balch and Haff,and clearly, no extension of the cited references in combination would make obvious the instant invention.

In view of the foregoing, reconsideration and allowance are respectfully solicited.

respectfully
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WHAT IS CLAIMED IS:

36. A method of producing biochips comprising the steps of:

arranging a plurality of capillaries having bottom open ends disposed at predetermined spacing so that said open ends are adjacent to and above a planar substrate, said open ends having diameters which prevent biomolecules from dropping down by force of gravity under non-depositing condition;

providing said biomolecules in said plurality of capillaries;

providing polymerase chain reaction to amplify said biomolecules within said plurality of capillaries;

applying a voltage across said plurality of capillaries and said substrate during a depositing condition to allow said biomolecules to move downward by force of ~~gravity~~ attraction through said open ends to deposit said biomolecules on sites on said substrate at space intervals coinciding with said predetermined spacing of said plurality of capillaries; and

stopping applying of said voltage during said non-depositing condition so that said biomolecules are held within said plurality of capillaries by surface tension at said open ends which is greater than said gravity; whereby

accurate efficient control of said voltage applying causes uniform and reliable deposits of said biomolecules on said substrate.

37. The method of claim 36, wherein said polymerase chain reaction is performed by atmospheric temperature change or by heating with laser irradiation.

APPENDIX "A"

38. An apparatus for producing biochips comprising:

a plurality of capillaries having bottom open ends arranged at a same spacing interval as that of sites on a planar substrate disposed below said open ends of said plurality of capillaries, said open ends having diameters which prevent biomolecules contained within said plurality of capillaries from falling down by force of gravity under normal non-depositing state;

amplifying means for providing polymerase chain reaction to amplify said biomolecules within said plurality of capillaries;

adjusting means for adjusting a gap formed between said open ends of said plurality of capillaries and said planar substrate by moving either said plurality of capillaries or said planar substrate, or both;

transfer means for transferring said biomolecules from said plurality of capillaries to said sites on said planar substrate during said depositing state, and for enabling said biomolecules to remain in said plurality of capillaries during said non-depositing state, said transfer means comprising:

voltage means for applying voltage across said plurality of capillaries and said planar substrate so that biomolecules contained in said plurality of capillaries and usually held therein by surface tension at said open ends are deposited by force of ~~gravity~~ attraction onto said sites of said planar substrate, and

stopping means for stopping applying voltage so that said surface tension of said open ends causes said biomolecules

to be held within said plurality of capillaries during said non-depositing state against force of gravity;

whereby accurate control of said transfer means produces reliable and uniform biomolecule chips.

39. The apparatus of claim 38, wherein said amplifying means comprises means for providing said polymerase chain reaction by temperature processing.

APPENDIX "C"